**Necessity of Testing.**—Don't be afraid to test the urine, eyes, blood, etc.; if necessary, have an X-ray examination, and use every known method of diagnosis and treatment, as well as the ultra-violet rays, to help the patient. Then good results may be expected.

Men like Sir Henry Gauvain, in his work at Alton, found that until they used the artificial rays, they could not obtain the same results as Rollier in the Higher Alps. Notwithstanding the progress made in this work in the last few years, we are still only on the fringe of what will be known about it in the future. It is not only by laboratory work, but by a combination of the scientist and the clinician working together that we shall get results. Both are necessary to each other if we are to attain any lasting benefit in this ray.

**Effects on Patients.**—Ultra-violet ray acts differently on patients; it stimulates some, and they feel the immediate benefit; in others it has a suporific effect. Good results are obtained on nearly every patient, but with those suffering from diabetes, lung tuberculosis, cancer, etc., only a toning-up effect can be expected. The ultra-violet ray has also an accumulative result, and the good effects are felt for many months after treatment has ceased. Until we really know more about this ray, many things will be difficult to understand; we must work upon results and watch the effects.

How does the taking of medicine really cure a patient? We know by experience that certain drugs act upon a disease. By constantly watching their effect upon that disease, we get a fairly consistent result. We are still in the dark as to how it really acts, notwithstanding all that science has taught us; so that we cannot expect to know everything about ultra-violet ray for some time yet, though each day teaches us something.

**Open Arc Lamps.**—The carbon arc lamp is sometimes preferred for general baths when giving artificial radiation. This ray contains a large quantity of infra-red, and a fair

Wave-lengths in millimicrons (1$\mu\mu$ equals 10 Ångström units).

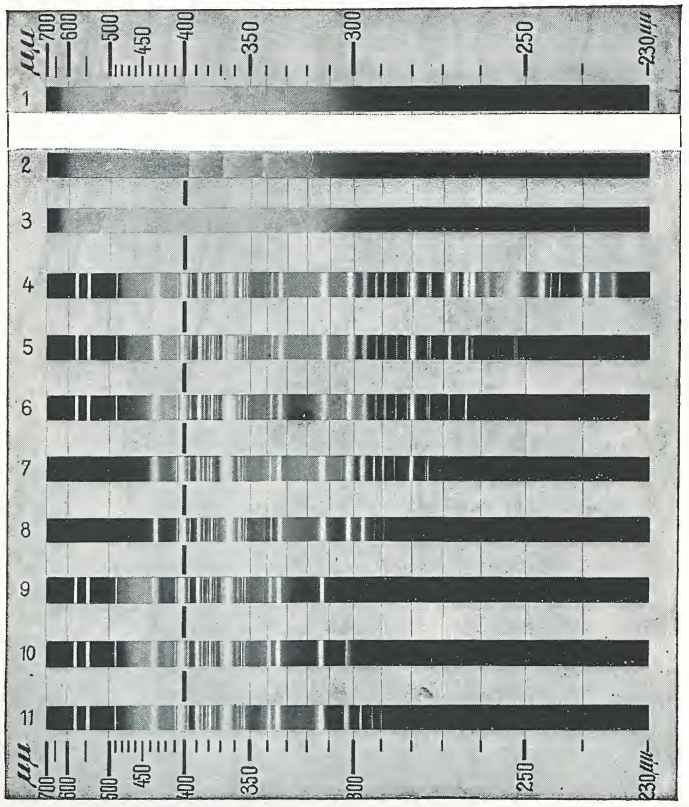



FIG. 2.—Spectra of different Sources of Light.

1. Sunlight (at sea level). 2. Carbon Arc Lamp. 3. Sollux Lamp (Tungsten filament). 4. "Artificial Alpine Sun" Quartz Lamp (without filter). 5. "Artificial Alpine Sun" Quartz Lamp through 1·3 mm. white Uviol glass. 6. "Artificial Alpine Sun" Quartz Lamp through 2·6 mm. white Uviol glass. 7. "Artificial Alpine Sun" Quartz Lamp through 1·3 mm. blue Uviol glass. 8. Artificial Alpine Sun" Quartz Lamp through 2·6 mm. blue Uviol glass. 9. "Artificial Alpine Sun" Quartz Lamp through thin window glass (1 mm.). 10. "Artificial Alpine Sun" Quartz Lamp through 0·25 mm. celluloid sheet. 11. "Artificial Alpine Sun" Quartz Lamp through 0·05 mm. mica sheet.

[*To face p.* 16.

local and general radiation.)—This lamp is equipped with close-fitting doors, which are opened for general radiation, and closed for local. The doors are fitted with a holder, into which

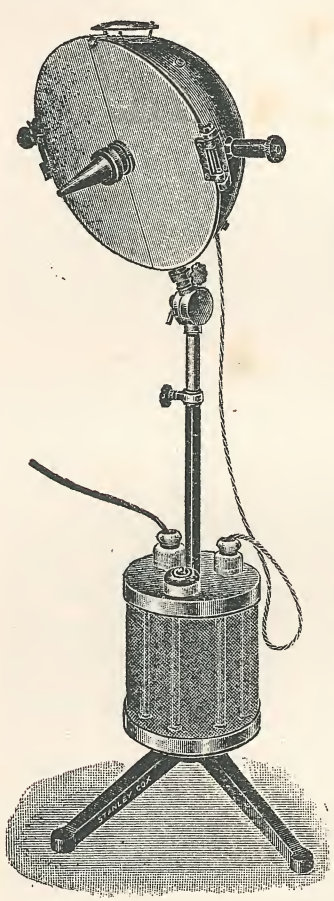


FIG. 4.

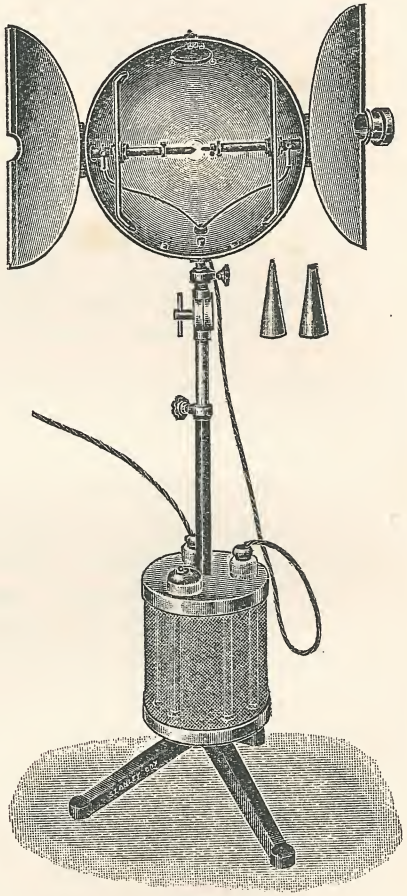


FIG. 5.

Tungsten Arc Lamp, fitted with Tungsten, Carbon, or Steel.

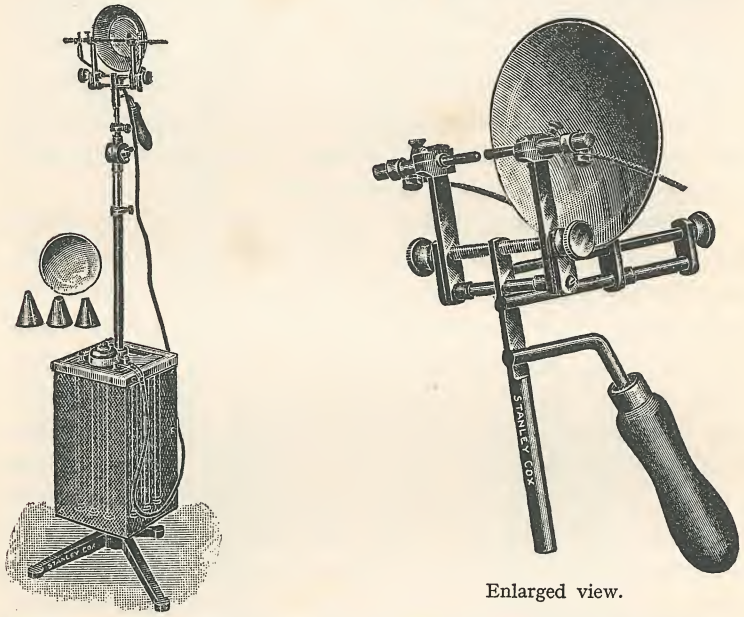
a quartz lens may be inserted for focussing the light to a pin-point to treat any part of the body; this is generally used only for small areas. This lamp is very compact and easily



worked, and either tungsten, metallium, or carbon may be used in it. The resistance has been arranged round the stand, so that the lamp may be moved to any part of a room, or from room to room if desired. The lamp portion is fitted on an angling joint, thus allowing the lamp to be tilted to any required position. There is nothing to go wrong, no complicated mechanism, and when burning, needs only a half-turn of the electrodes to the right, so as to keep the points the required distance apart. This should be done about every fifteen minutes. It can be used for every kind of local and general treatment, and is therefore convenient for the general practitioner's rooms, or for the home, providing the treatment is carried out under skilled supervision.

**Author's Tungsten Arc Lamp** (Figs. 6 and 7).—This lamp has been designed for local work only, and if kept to this work, it has many advantages over any lamp at present on the market. It is fitted on a stand, with the necessary resistance round the base, and has been so designed that it may be lifted off the stand and held in the operator's hand, to facilitate the raying of any part of the patient's body. The electrodes are tungsten, but there is no reason why metallium should not be used. Metallium electrodes are designed to fit this lamp, which weighs under two pounds, and is easy to manipulate when treating the gums, throat, ears, or any small area. By altering the position of the reflector, *i.e.* by bringing it nearer or farther away from the electrodes with a milled handle at the back of the lamp, the beam of ultra-violet ray can be focussed to 2 inches in diameter, or reduced to the size of a sixpence. By manipulating the milled handle, the points of the electrodes can be approached or receded at will. It may be stated here that the best distance apart for the electrodes, after the arc is struck, is about $\frac{1}{4}$ inch. It has been found by experiment that the greatest quantity of ultra-violet ray is given off when about that distance is maintained; this refers to any arc lamp when fitted with

either tungsten or metallium. The resistance is so constructed that when the arc is struck, not more than 3 amps. are used; there is no reason, therefore, why it should not be fitted to the ordinary plugs for household lighting. Furthermore, the resistance may be removed from the stand, and it and the lamp taken to a patient's house for use by the practitioner. Heavy work should not be attempted




Enlarged view.

FIGS. 6 and 7.—The Author's Lamp for Local Treatment and Dental Work.

with this lamp; there is another more suitable for the purpose (Fig. 11). If the author's lamp is kept to the lighter work, the writer thinks that it will be found that it is light, handy, and easy to manipulate.

He has been informed by Mr. Stanley Cox that cones 6 inches or more in length, with or without tongue depressor, and of varying diameters, have been put on the market to suit those who find it difficult to direct the ray to the tonsils



or any part of the gums. However, if the lamp is properly elevated and focussed, no difficulty should be found in directing the ray to any part of the body, whether in the mouth, nose, or vagina, etc. Care should be taken that the

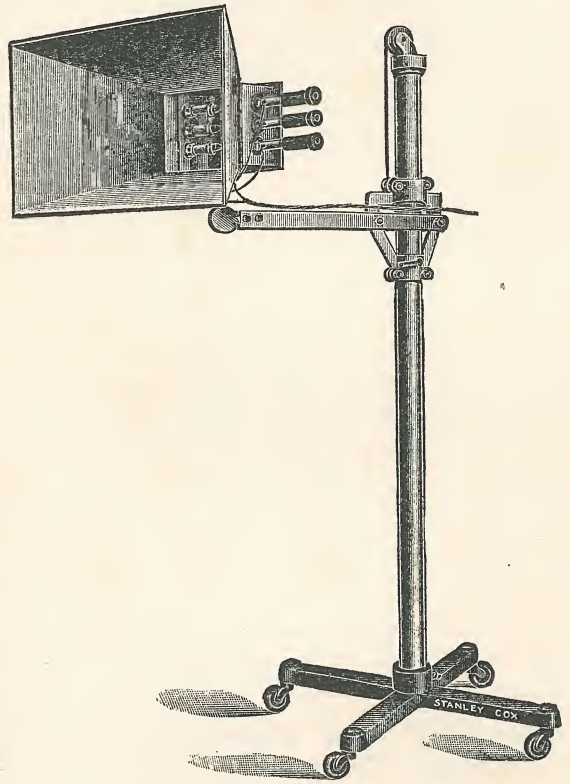



FIG. 8.—Author's Lamp for General Radiation.

point where the arc is struck, is always exactly opposite the centre of the reflector.

**Author's Tungsten Carbon Arc Lamp** (Fig. 8).—The writer has felt that a lamp was badly needed, capable of producing carbon or tungsten rays at will, without disturbing the patient, therefore this lamp was manufactured to give both

carbon and tungsten radiation, separately or together, and is designed for general work only. It consists of a stand to which is fitted a cross-bar upon which the lamp is fixed. This cross-bar is so made that it will slide up and down the stand as required. The resistance is shown separately. The two pairs of carbon electrodes are in series, and may be used together or separately with the tungsten arc. The reflector at the back of the electrodes is easily removed for cleaning purposes, or for adjusting the electrodes when necessary. The large reflector is also removable.

The striking of the arc in this lamp, and in fact in all arc lamps, is a very simple arrangement. One of the handles on either side is turned to the right until the electrodes touch, when the handles are reversed until an eighth of an inch separates the electrodes. This distance is kept for one or two minutes until the electrodes have reached a certain temperature, when they may be separated to a $\frac{1}{4}$ inch and kept so, as it has been found by experience that at this distance the best amount of ultra-violet ray is obtained. To alter the distance between the electrodes, it should not be necessary to move the handles oftener than every eight to ten minutes, and all that is needed is a half-turn to the right to bring the points slightly closer. Nothing can go wrong, which will be found a great convenience for those living at some distance from a repairer. The current consumption of the carbon arcs is 8 amps, and the tungsten arcs 5 amps.

**The Kromayer Water-cooled Lamp** (Fig. 9), designed by Prof. Kromayer, is manufactured in this country by the British Hanovia Company. Different types of this lamp have to be used for direct and alternating current. The lamp for direct current consists of an inverted **U**-shaped arc tube of fused quartz ; it also has two horizontal polar vessels attached to the end of each tube. The arc tube is surrounded by a quartz jacket, and this again is encased in a watertight metal case, which is fitted in front with a quartz window. At the



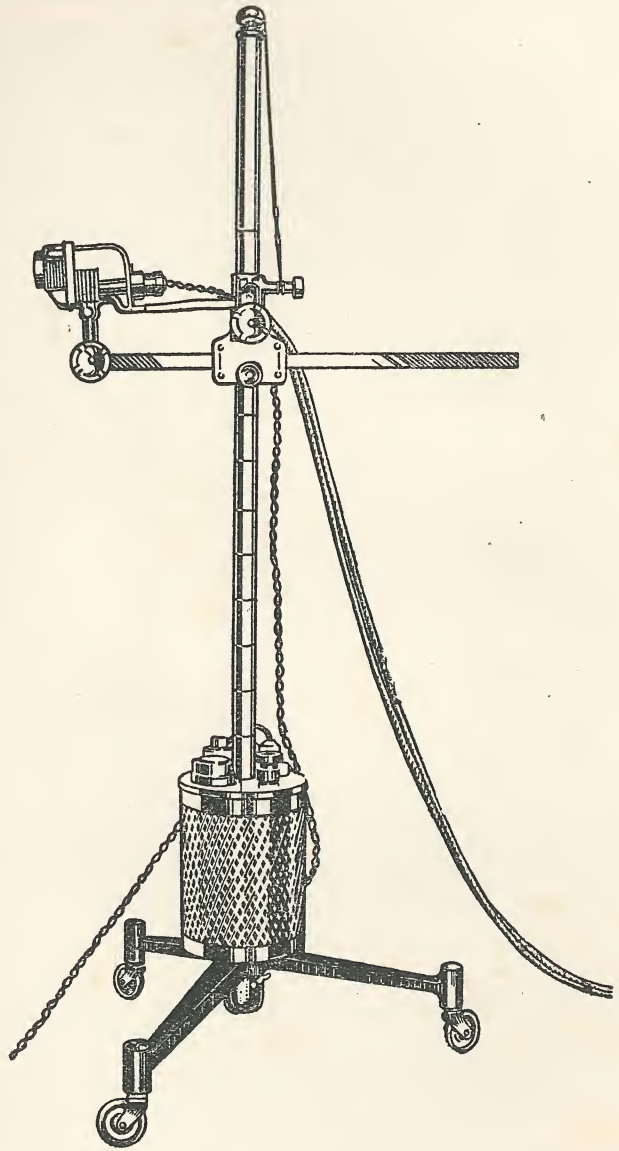
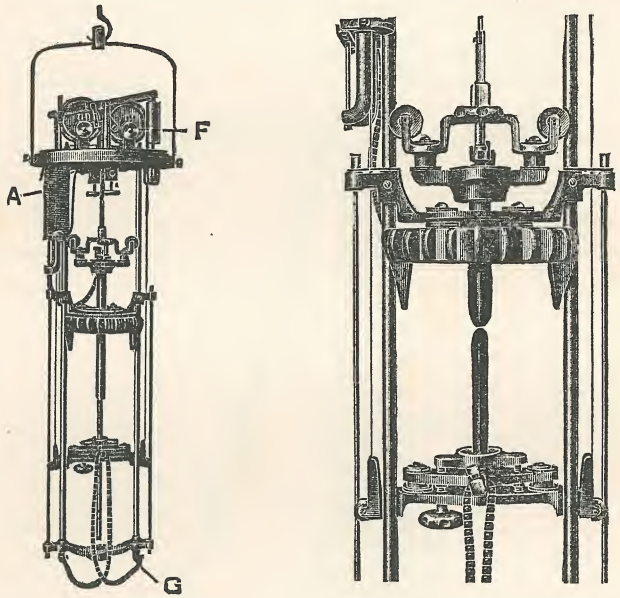


FIG. 9.—The Kromayer Water-cooled Lamp.

back of the case, inlet and outlet openings are situated for the water-cooling arrangement. The quartz window itself may be used for giving the ultra-violet ray or for special applicators. The lighting is the same as for most of the mercury vapour lamps, *i.e.* by tilting it gently forward instead of to the right, and taking it back to the vertical; this brings the mercury in the arc together, and causes the arc to be




Showing lamp without cover. Close-up view of mechanism.
A, Magnetic coils; F, Counter-balance; G, Insolated leads.

FIG. 10.—"Sunray" White Flame, 30 amp. Automatic feed, Open flaming Carbon Arc Lamp. (Cox-Cavendish Electrical Co. (1924), Ltd.)

struck. When first lighted, the lamp consumes greatly in excess of the normal current. The water circulating must be free from impurities.

This lamp is said to provide the shortest wave-length, and is for local irradiations and skin diseases only.

**"Sunray" Lamp** (Fig. 10).—This type of lamp employs specially impregnated cored carbons and is of the open white

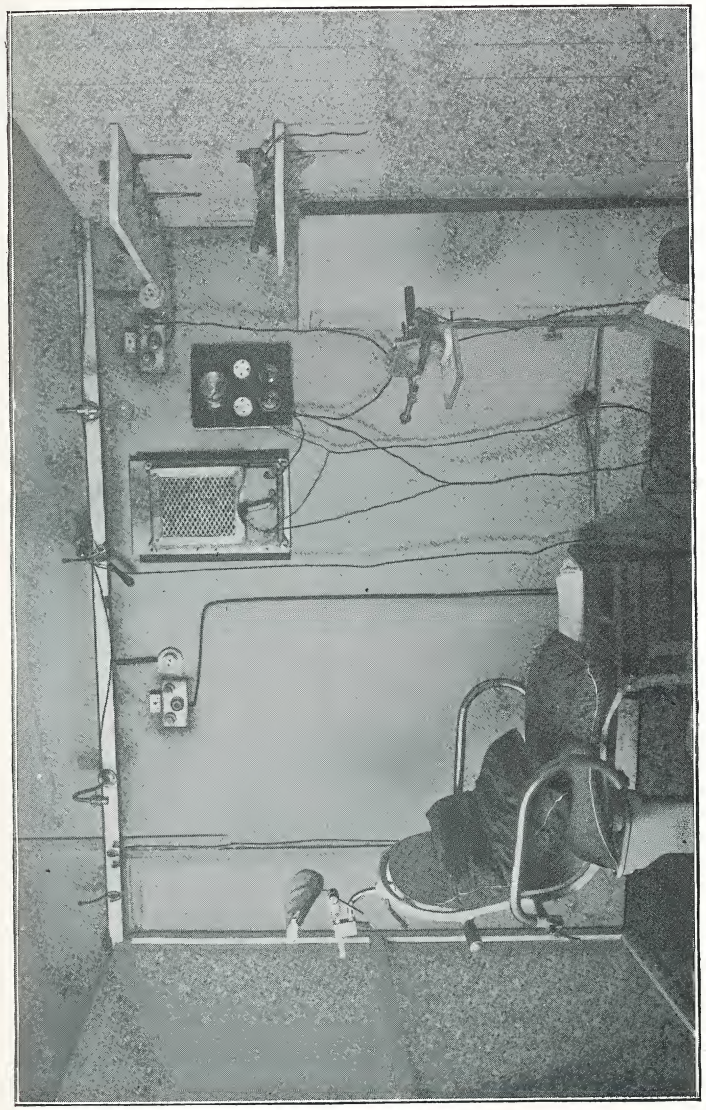


FIG. 11.—Author's Raying Room, showing large and small lamps for local work, with shield for inhalation.
[*To face p. 26.*

resistance, so that 2 to 10 amperes may be used, if found necessary.

Very great heat can be produced with this lamp, bringing

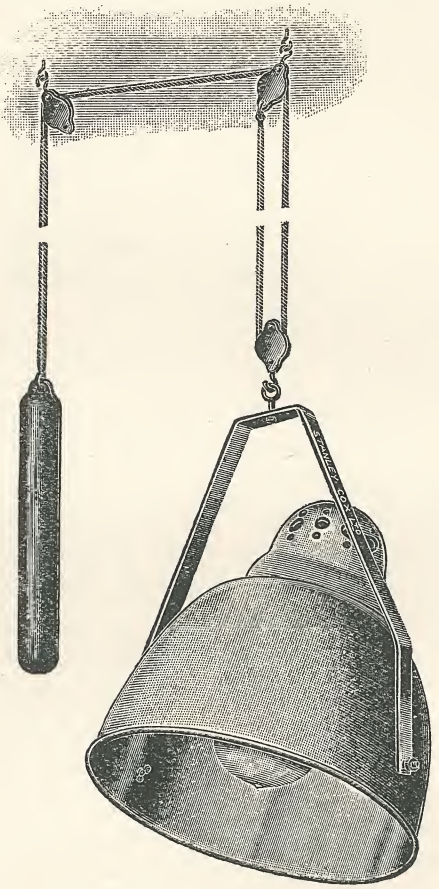


FIG. 12.—Round Radiant Lamp.

out an intense erythema in a few minutes. For neuritis, sciatica, or rheumatism, it is excellent.

**Radiant Heat Apparatus** (Fig. 12).—This lamp can be made in two shapes, round or oblong; a convenient size for the latter is 2 feet by 18 inches. It may be fixed on a stand,

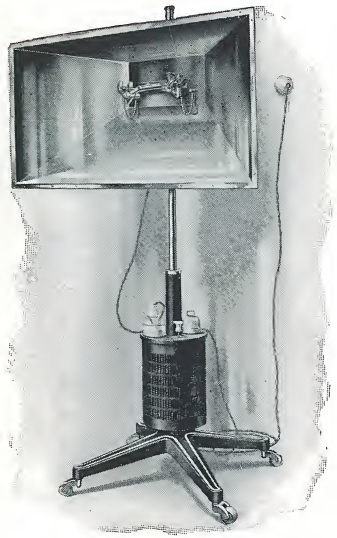


FIG. 13.—Jesionck Lamp

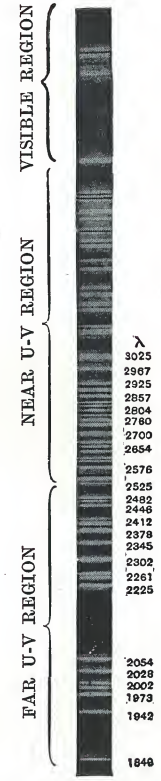



FIG. 14.—Quartz Mercury Spectrum.

[*To face p.* 28.

original position, leave it for three or four minutes to warm up, and it is then ready for use. The only drawback to this type is that, after the lamps have been used for a period of about 300 hours, the envelope or burner becomes discoloured. In other words, the fused quartz of which the burner is made decomposes, and does not pass the shorter and very necessary wave-lengths. The result is a corresponding drop in the efficiency of the lamp, which necessitates either the replacement of the burner or its return to the makers for cleaning; both equally costly, because if the latter is done, one is faced with the problem of being deprived of the lamp for treatment, or buying a spare burner.

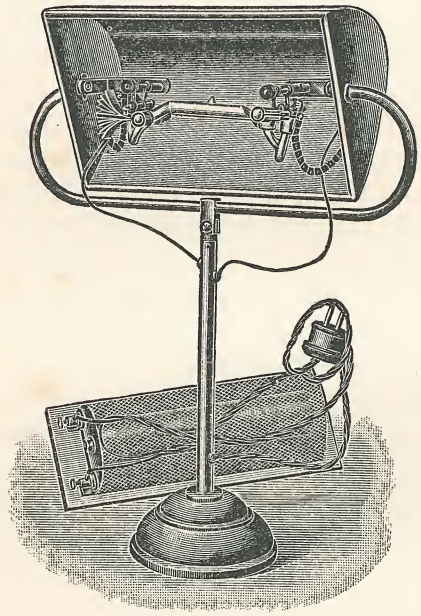


FIG. 15.—"Alps" Model Portable Quartz Mercury Vapour Lamp

**"Alps" Model Portable Quartz Mercury Vapour Lamp** (Fig. 15).—The above lamp is designed for portability, and particularly for bedside treatment A concave duralumin reflector with a rectangular opening is provided, and a standard quartz mercury vapour burner is fitted. The arc is struck by a simple tilting movement of the reflector; the burner itself not being separately tilted is saved a jar. A suitable resistance is supplied for direct current, or a transformer for alternating current. A portable case, made to fit the lamp, can be supplied.

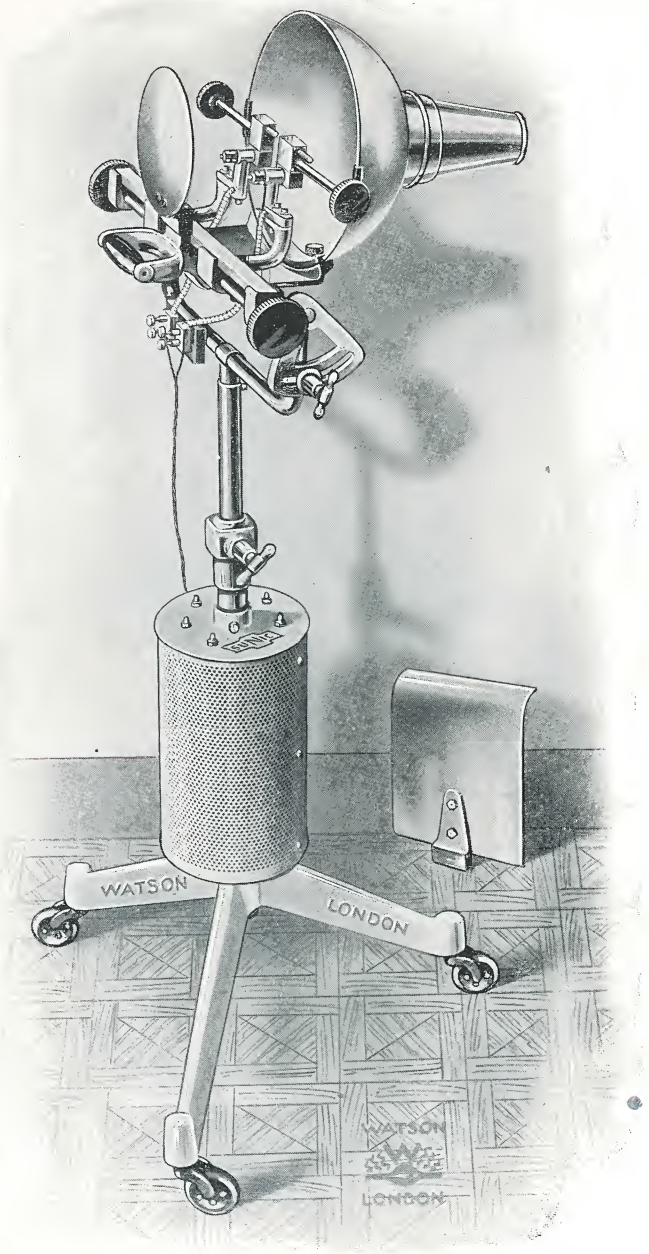



FIG. 16.—The Sunic Tungsten Arc Lamp.

*To face p 30.*

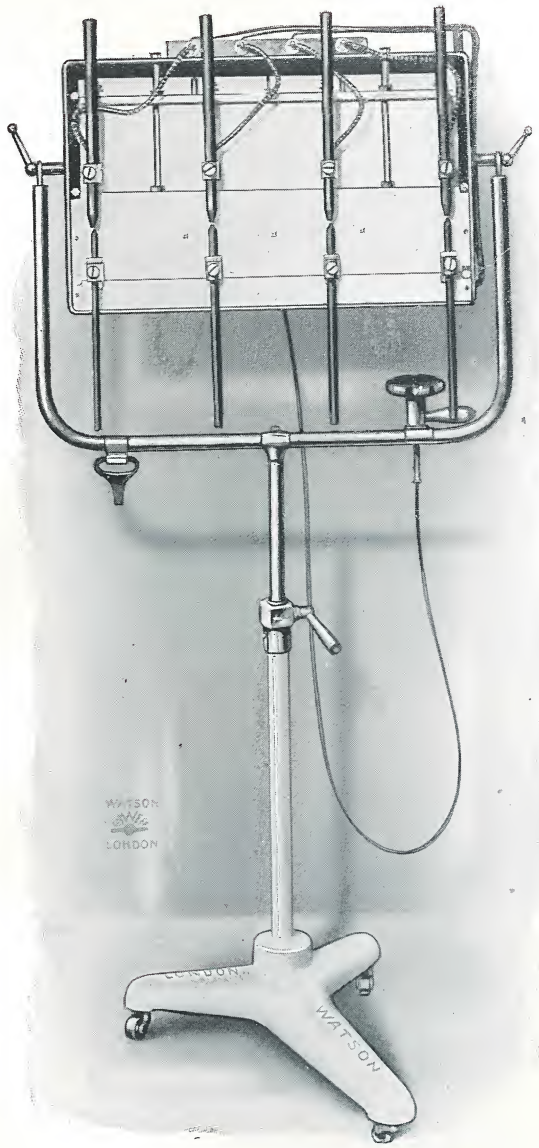



FIG. 17.—Multiple-Carbon Arc Lamp.

[*To face p.* 30.

The method of inserting the carbon electrodes is a little out of the usual, that is to say, that instead of the electrodes being inserted so that the arc is struck on the horizontal plane, they are inserted in parallel series in the direction of the patient. This, in practice, proves an advantage, as it enables the arc to be opened to a distance of 1 inch; at the same time the electrodes burn evenly and steadily until they are exhausted. Another useful feature is the small thumbscrew adjustment of the arc; this has a general action, and enables fine adjustments to be made.

*Model No.* 2.—From the medical man's point of view, this is perhaps the most interesting. It is arranged for use in conjunction with Model No. 1, as at present there is no independent resistance supplied. The lamp itself is fitted to an adjustable stand which can be locked into position with a thumbscrew. In addition it is pivoted on a ball joint, also locked by a thumbscrew, which enables the lamp to be moved in any direction, and to any angle. It can be taken off the stand, and used as a hand lamp to irradiate various parts of the body. Another well-planned feature is the provision of a cone-shaped hood fitted on an adjustable rack, which holds a frame for inserting filters. Owing to its extreme lightness and portability, local areas of small diameter can be treated. For so small a lamp, the output of ultra-violet radiation is exceptionally good; on the spectroscope it was clearly defined to 2,200 Å.U., being, of course, extremely rich in the longer wave-lengths around 3,500 Å.U., as carbon electrodes are used. When necessary, tungsten electrodes could be used, if direct current is available.

There is no reason why Model No. 1 should not be used in the home, if under medical supervision. An amperage of 2 is taken to maintain the arc at a steady even burning rate, which enables it to be worked off any lighting circuit.

**The Heliol Lamp** (Fig. 19).—This lamp is an enclosed

FIG. 18.—The Apex Lamp. Model No. 1.

[*To face p.* 32.

is built into a teak cabinet, fitted with leather carrying-handle, and weighs 22 lbs.

**The Expometer,** which forms an integral part of the Uvral apparatus, is built in the form of a separate unit contained in a mahogany cabinet, and can be used in a vertical or horizontal position. By means of this apparatus, automatic control of exposure can be obtained on any ultra-violet ray apparatus taking up to 30 amps., whether used on direct or alternating current circuits. The dial of the timepiece is graduated from zero up to fifteen minutes, but if a longer exposure than fifteen minutes is required, it can be re-set just before the pointer reaches zero, to give a further fifteen minutes' exposure, or any portion of same. This can be repeated, until the required length of treatment has been given.

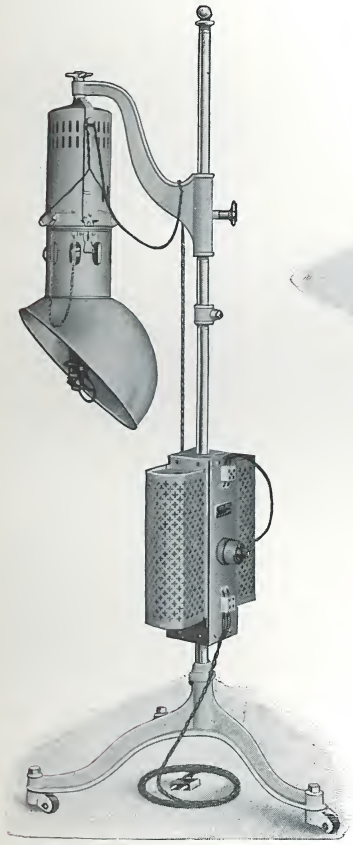


FIG. 19.—The Heliol Lamp.

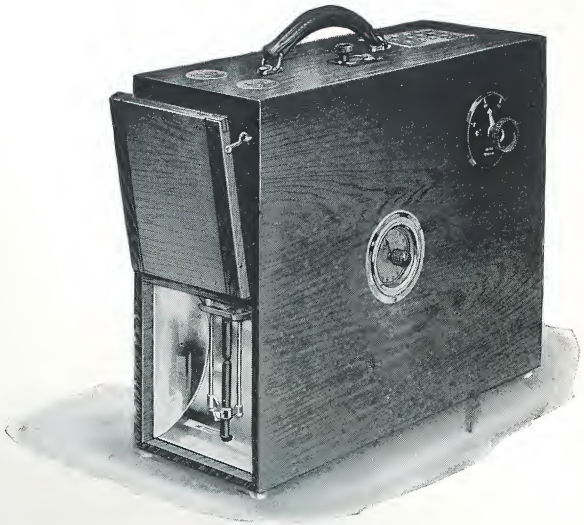


FIG. 20.—Uvral Apparatus.

FIG. 21.—The Expometer.

[*To face p.* 34.

It must be remembered that the object is to measure or obtain some idea of the quantity and quality of ultra-violet rays, which, of course, are invisible and must therefore be separated, otherwise the test becomes partly the test of ultra-violet rays and still more so of visible rays.

**The Actinoscope.**—Here we have an exceedingly useful little instrument, which does practically everything required. It always gives uniform results, as it has no chemical components, nor is it affected in any appreciable degree by visible light, because until it is focussed on the lamp nothing can be seen.

The actinoscope consists of a telescopic tube 6 inches in length, and about 1 inch in diameter; at one end is placed a special glass filter not less than $\frac{1}{4}$ inch in thickness, and opaque to all visible light, with the exception of the very low violet radiations at the commencement of the visible spectrum. At the other end of the tube is a uranium glass screen, which absorbs all the ultra-violet radiations, and causes the screen to fluoresce according to the intensity or quantity of ultra-violet rays passed by the filter. So sensitive is this, that when a piece of welder's blue glass or other tinted lens is interposed between the filter and the lamp, a very slight shadow is cast on the screen, which denotes that the wave-lengths absorbed by this glass have been cut off, and only the higher wave-lengths which are transmitted through the glass, are registered on the screen. A shield is attached at the screen end of the telescope to protect the eyes when examining the lamp.

Embodied in the shield on either side are two standard colour gauges, the one on the left being a brilliant apple-green, and the other a dark olive-green. When the actinoscope is held in line with the arc of the lamp, one can readily detect whether the lamp is rich in ultra-violet output or not, by comparing the tint shown on the fluorescent screen with the standard colour gauges on the shield, the one on the left



(apple-green) being the desired tint to aim at. The colour gauges are carefully matched with the colours as shown on the spectroscope, when the lamp is giving a rich or poor emission of ultra-violet rays, as the case may be. If further proof is needed that only ultra-violet rays are being transmitted, and are acting on the uranium screen, take any glass or other filter, which cuts out a considerable portion of the visible rays, but transmits ultra-violet rays, and place it in

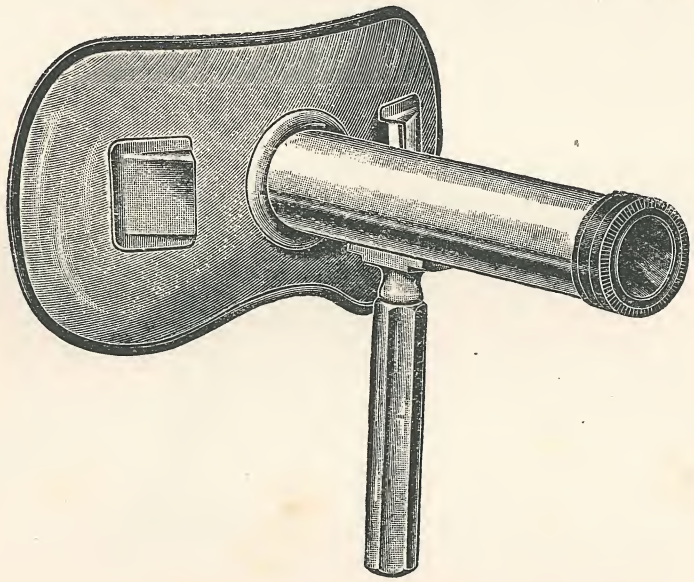


FIG. 22.—The Actinoscope.

front of the actinoscope, when it will be seen that it has no effect on the intensity or brightness of the fluorescent screen. After a little practice with this instrument, it will be found that from a point of convenience it is only a matter of seconds to detect the quality and quantity of ultra-violet ray; also, its uses for experimental purposes are many.

The actinoscope can be obtained from any well-known electro-medical house; it is made by Messrs. J. & R. Fleming, Ltd.

**Spectroscope.**—This instrument has been described very fully on p. 35. Unfortunately, a good spectroscope is perhaps beyond the means of the average practitioner, but if accuracy of dosage is desired, it is necessary to make use of this instrument. It has been shown that the chemical test cannot be relied on up to the present, and that the actinoscope, although extremely useful, does not give the wave-lengths in the same way as the spectroscope.

Fig. 23 is an illustration of an Adam Hilger quartz spectroscope.

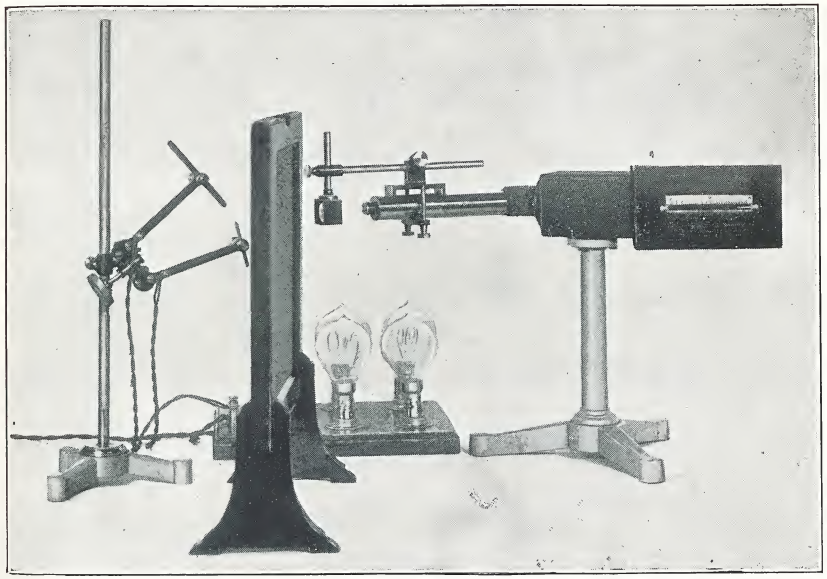


FIG. 23.—Adam Hilger Quartz Spectroscope, with Uranium Screen.

*To face p. 42.*

of efficiency and economy, proves that it is not the highest amperage which gives the greatest efficiency.

For instance, in one of the tests conducted, when a pure metal element combined with plain carbon was used, the output at approximately $3\frac{1}{2}$ amps. was exceedingly good. On increasing the amperage to 6, 8, and 9, there was, unexpectedly, a sharp decrease in the quantity and quality of the ultra-violet output, as registred by the visible spectroscope. This was so unexpected, that the test was applied many times, at intervals of a few days, to eliminate the possibility of error in these observations. This explains why the amperage is given in each test of the various metals, and this point should be noted carefully in the tables and illustrations given.

Before going any further, it should be added that the instruments used for these tests were the Adam Hilger quartz visual spectroscope, photographic spectroscope, and actinoscope.

**Tests with Certain Electrodes.**—These tests are divided into two classes: (1) Visual tests, (2) Photographic tests. In some of the elements under visual test, it was found, on taking an average, that the output, as shown on the fluorescent screen, was only moderate, combined with occasional momentary flashes of brilliant ultra-violet. This, of course, no matter how short it might be, was recorded on the photographic plate.

A table will be found below showing various electrodes with results obtained visually and photographically, with the length of time for each test. It is as well to state here that no bias was shown to any particular electrode; they were all obtained on the open market, from various sources, and the suppliers were not aware that these exacting tests were being made. They represent nearly all the electrodes that are sold, and used in the many lamps by those practising ultra-violet radiation to-day. These tests were all con-

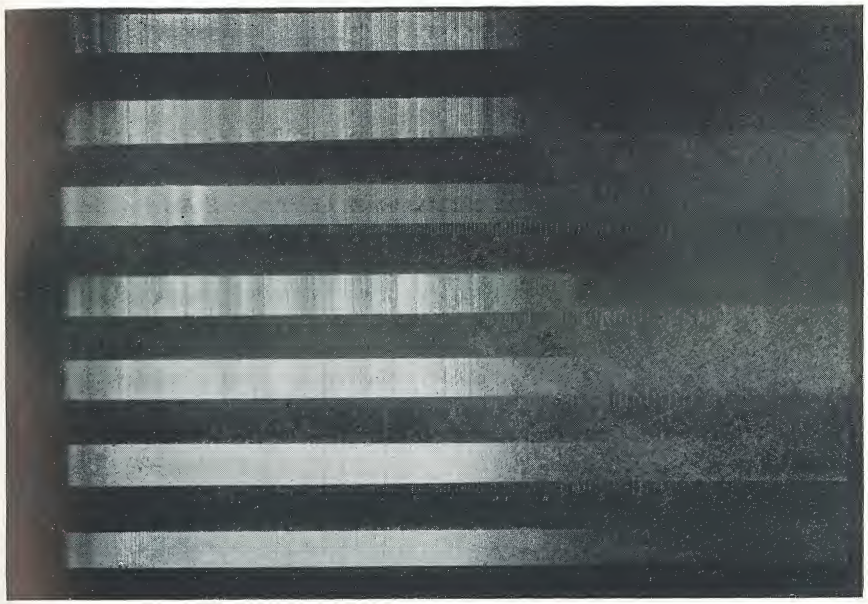



FIG. 24.—1. Tungsten Square (2); 2. Tungsten Round (2); 3. Steel (2); 4. Cored Carbons (2); 5. Plain Carbon (2); 6. Metallium and Plain Carbon; 7. Metallium (2)

*It may be stated that this photo has not been touched up.*

[*To face p.* 44.

*No.* 1.—The output as recorded by the spectroscope was very intermittent, that is to say, the output in comparison with the photographic test, was marked by periods sometimes extending for as long as four to five minutes, when there was very little ultra-violet shown.

*No.* 2.—Almost identical with No. 1.

*No.* 3.—This was also marked by periods of violent fluctuation in the output, and a great deal of spluttering was observed, caused primarily by the fact that there was too much manganese in the composition of the steel.

*No.* 4.—This was also marked by long periods of poor output, and a great deal of spluttering, caused, in the writer's opinion, by the metal element in the core burning far more quickly than the surrounding casing of carbon, thereby producing very erratic results, as nearly all these cored carbons do.

*No.* 5.—As shown in the photograph of the spectrum, the output was by no means good, and was accompanied by an excess of light in the visible region; but on the other hand it was steady and continuous through the period of observation.

*No.* 6.—Metallium electrode and carbon was shown to great advantage, and the output as recorded by the photographic plate, had no variation whatsoever, and no break in the arc for twenty minutes continuously. One cannot speak too highly of this combination.

*No.* 7.—Two metallium electrodes; the results were precisely the same as with No. 6. Either of these is equally good element to use, as from the moment the arc is struck, an extremely rich and continuous output is given, which after all is the most desired object at which to aim.



## Detailed Visual Analysis

| *Electrode.* | *Period of observation.* | *Amp.* | *Remarks.* |
|---|---|---|---|
| Squared tungsten, obtainable everywhere | 15 to 20 mins. | 3 to 4 | Periods of intense output extending down to 2,000 Å.U., followed by long periods of indifferent output extending down to 2,700 Å.U. Arc broken many times. On the whole unreliable and disappointing. A good deal of dropping metal and splintering. |
| Small round tungsten | 15 to 20 mins. | 3 to 3½ | Good output on the whole, extending down to 2,000 Å.U. At times extremely rich. Spluttering and falling pieces not so noticeable. On the whole more reliable than the square. But output not steady and continuous. |
| Two pieces of steel. Supplied by a well-known house | 15 to 20 mins. | 3 to 3½ | Good output extending to 2,200 Å.U. with distinct bands. Subject to a great deal of spluttering and falling pieces. Breaking of arc and sparkling effect due to high content of manganese, and low content of carbon. Periods when a very poor output was shown. |
| Cored carbons. Two pieces | 15 to 20 mins. | 3 to 4 | Comparatively poor output, with occasional periods of richness extending down to 2,300 Å.U. Great spluttering and breaking of arc. Could be best compared to children's sparklets. From a medical point of view, thoroughly unreliable. |
| Plain carbons. Two pieces. | 15 to 20 mins. | 3 to 4 | Fairly rich and steady in output, but only extending down to 2,300 Å.U. Richest round about 2,900 Å.U. upwards. Useful when quantities of long rays are required, but very deficient in the shorter and medium rays. |

| *Electrode.* | *Period of observation.* | *Amp.* | *Remarks.* |
|---|---|---|---|
| Metallium electrode and plain carbon | 15 to 20 mins. | 3 to 4 | Immediate and continuous image down to 2,200 Å.U. Absence of spluttering and falling pieces of metal. Output, whilst rich and steady, not quite so good as that given by the metallium alone. |
| Metallium electrode. Two pieces | 15 to 20 mins. | 3 to 4 | Immediate and continuous image down to 2,200 Å.U. Absence of spluttering or falling pieces of metal. Distinct bands throughout the spectrum, and an extremely rich and steady output. Unquestionably the most efficient of any tried. |

The foregoing bring us to one definite conclusion ; that the problem of the best electrode for medical purposes has not been solved yet.

This leads us to the fact that the various constituents which make up an electrode, whether they be metallium, carbon, or carbon core, should have an analysis accompanying each piece sold, so that it can be kept to a definite standard and thus eliminate to a great extent the marked difference in these electrodes, which the tests showed with such excellent results for the metallium electrode.

**Metallium.**—The writer was very dissatisfied with the results from the electrodes supplied by the trade, and owing to the great assistance given to him by Mr. H. G. Somerfield, M.Inst.Brit.F., M.Inst.Met. (secretary of the London branch of the British Institute of Foundrymen), he was able to have a metallic electrode manufactured that would act in a more reliable manner than others on the market.

It has thus been possible for the first time to lay down a definite analysis for a metallic electrode, making for

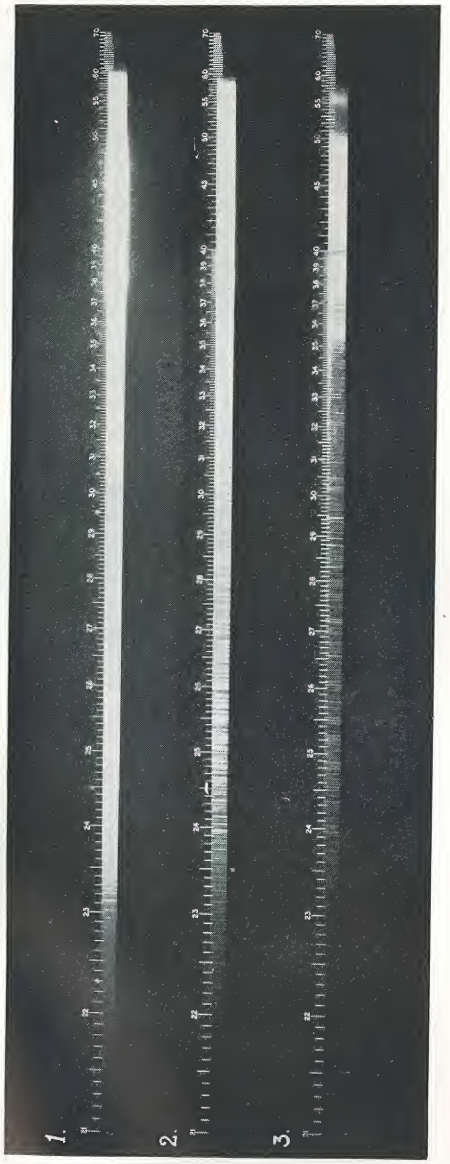



FIG. 25.—Three Photographs of different exposures from the National Physical Laboratory. [*To face p.* 48.

visible light to a very marked degree, and seems quite comfortable to the eyes, but when tested with the spectroscope, all three forms of glass were found to transmit a very large proportion of ultra-violet rays.

In Figs. 26 and 27 will be found the results of tests carried out in the laboratories of Messrs. Adam Hilger, under independent supervision, and with the most efficient type of spectroscope yet produced. The name of this firm is sufficient guarantee. There will also be found the results of tests of the recommended glasses, which show total elimination of all harmful ultra-violet rays. It may be stated that all the glasses under test were chosen from a manufacturer's stock, and the exposures in every case were identical, viz. half a minute.

All spectro-photograms should be examined with the aid of a reading glass, or powerful magnifying glass.

**Goggles under Photographic Test.**—Seeing that so much has been stated about the absorptive properties of various glasses, tinted and otherwise, which has not always been accurate, to say the least of it, a detailed analysis of the foregoing spectro-photograms will not be out of place.

Fig. 26: *No.* 1 shows a transmission of an open arc, which consisted of two pieces of metallium steel. The same electrodes were used throughout the test, each exposure being of half a minute's duration.

*No.* 2 shows the result of No. 6 tint, welder's blue. This was placed in front of the source of light and the slit of the spectroscope. It will be seen that there is a considerable transmission definitely extending down to 2,950 Å.U.

*No.* 3.—A piece of No. 6 tint, smoke, was inserted, which showed a definite transmission down to 3,000 Å.U.

*Nos.* 4, 5, *and* 6 consist of a piece of Cruxite, Crookes A, and Crookes B2 respectively. The results are extremely interesting as this glass is frequently recommended for use

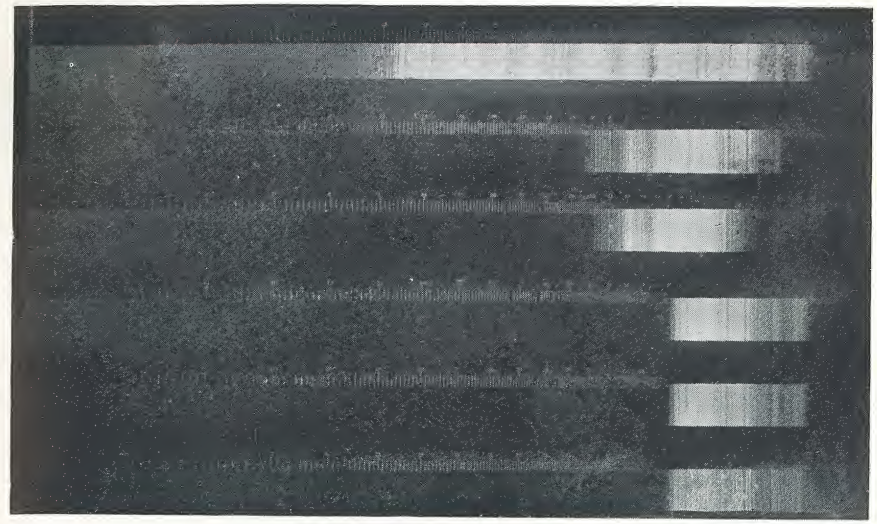



FIG. 26.—Glass Transmission of Ultra-violet.

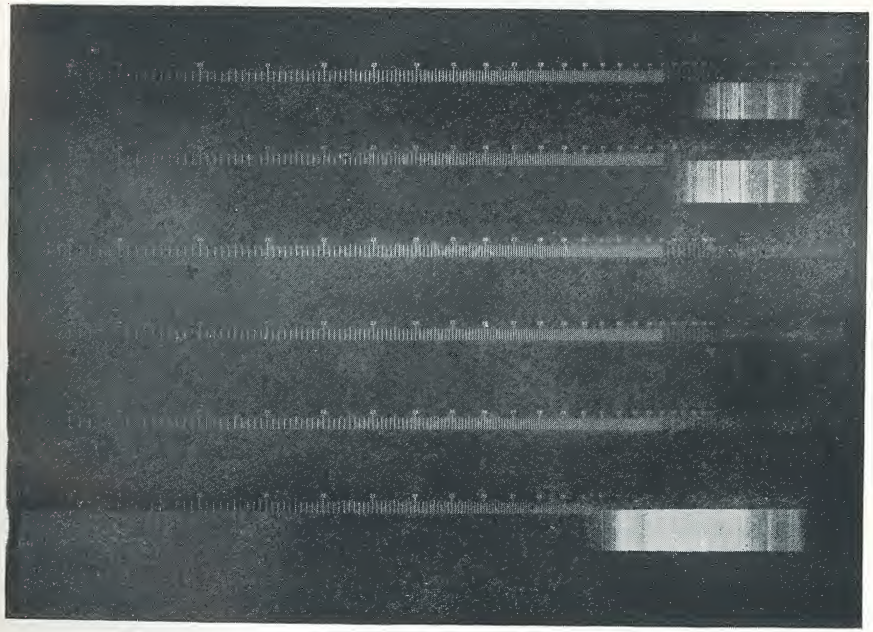



FIG. 27.—Glass Transmission of Ultra-violet.

[*To face p.* 54.

interest to many, as the writer believes that this is the first serious attempt to deal with this subject in a technical manner.

## Goggles

There are many forms of goggles on the market, a few of which are illustrated. First cost should not always be the deciding factor, and unquestionably the goggles purchased should be sterilisable, as it is quite easy to transmit disease from one patient to another and the results of this may be very alarming.

Many women object to using goggles, as towards the end of the treatment they sometimes leave white marks or rings round the eyes. There is a light and well-made face shield on the market, which is admirably adapted to prevent this—the Fleming model No. 500. (Face mask.)

Suitable Goggles to Wear.

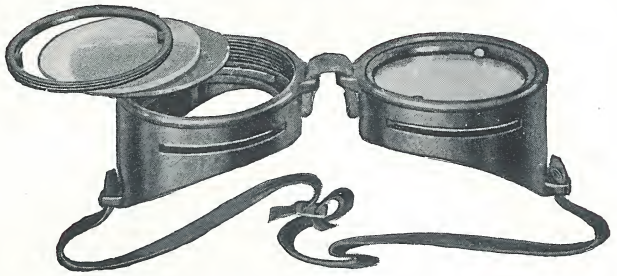


Fig. 28.—Wellsworth Hardy Goggle. Pfund gold-plated lenses (sterilisable).

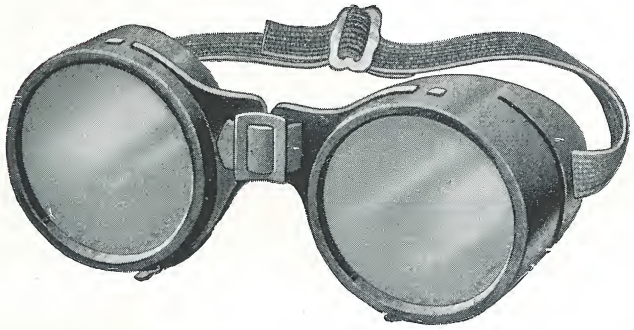


Fig. 29.—Wellsworth Model 444. Saniweld lenses (sterilisable).

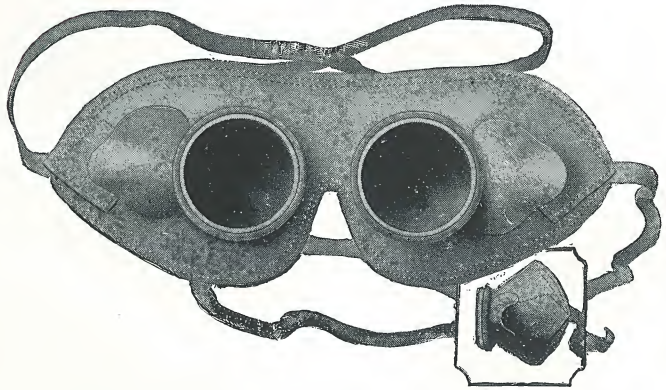


Fig. 30.—Fleming Model. "Absorbo." Note ingenious ventilation.

[*To face p.* 56.

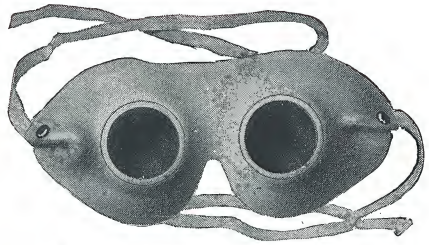


FIG. 31.—Fleming Model. "Absorbo." Suitable for infants.

FIGS. 32 and 33.—Model 500 Face Mask.

[*To face p.* 56.

ultra-violet radiation, either with the tungsten, metallium, or mercury vapour lamp, giving the second degree for mild, and third degree for severe cases.

**Urticaria.**—Many writers state that this condition can be very easily treated with ultra-violet radiation, but this is not the author's experience. Very great difficulty has been encountered in these cases to obtain the desired effect, and in every instance it has been necessary to combine vaccines and dieting, to have any results. Ultra-violet ray alone rarely does good. In order to ascertain the root of causes that are so varied, one must go further into the matter than one can with the rays alone, therefore they should be tried in combination with vaccines and dieting.

**Leucoderma (White Skin).**—Of this variety of case only one has been met with in the writer's practice, and it must be admitted that the results were poor. A third degree erythema was produced, but without visible effect. Some writers on the subject claim to have cured these cases with ultra-violet radiation.

**Pruritus : General, Anal, or Vulval.**—No matter where the irritation is, before starting on a case one must try to find the cause. To give ultra-violet ray indiscriminately is to court disaster. Pruritus may be due to a variety of causes : to a parasite, pediculi, hæmorrhoids, worms, or fissure (a usual cause if in the rectum), to a vaginal discharge, or to that somewhat rare cause, " mental pruritus " (in which the patient suffers from the delusion that the skin is swarming with insects) ; but whatever the cause, it must be removed before the ray can be expected to relieve. Cases are occasionally met with in which there are none of these causes—here the ultra-violet ray steps in and cures.

*Latent Effect.*—To illustrate this, some two years ago the writer was asked to treat a woman suffering from a severe attack of pruritus vulvæ, for which no apparent cause could be found, nor any vaginal discharge. She was treated with the

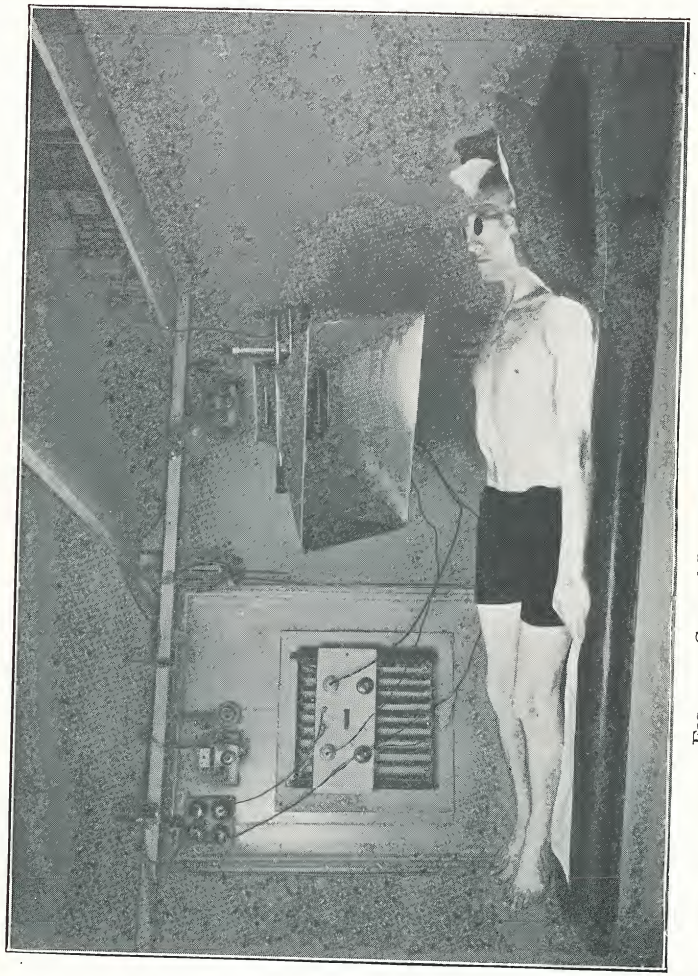


FIG. 35.—General Irradiation with Author's Lamp. [*To face p.* 88.

the light from an electric light bath is kept going day and night, but the ultra-violet ray is only given once daily for three minutes, at 36 inches distance, with the mercury vapour lamp.

**Electric Light Cabinet.**—The best method is to put the patient into an electric light-bath cabinet, taking care that the heat is not too intense. In this way, nearly the whole body is exposed to the light at once. The patient should wear as little clothing as possible, and all burnt parts should be constantly exposed to the light, which should never be turned off, night or day, until the patient is cured. This will be in an astonishingly short time, as compared with the old method of treatment.

If this treatment is followed out systematically, it will be found that the temperature keeps normal, there will be absence of pain, no suppression of urine, and no dressings required. Blisters should not be opened, but allowed to dry up, and scabs should not be pulled off, but allowed to fall off of their own accord. Scarring will be absent.

**Deep Therapy Lamp.**—If the burn is not very extensive, the light from a deep therapy lamp may be used, provided it plays on the wound day and night, and is not too near to cause extensive heat. Healing may be expected from the twelfth to fifteenth day; that under the old method naturally takes months.

Light therapy with a suitable amount of ultra-violet radiation daily, is, par excellence, the best for these cases. It will be found that—

(1) It relieves pain;
(2) Requires no dressings;
(3) Keeps down infection;
(4) Eliminates scars and contractures;
(5) Is a wonderful tonic;
(6) Accelerates elimination.

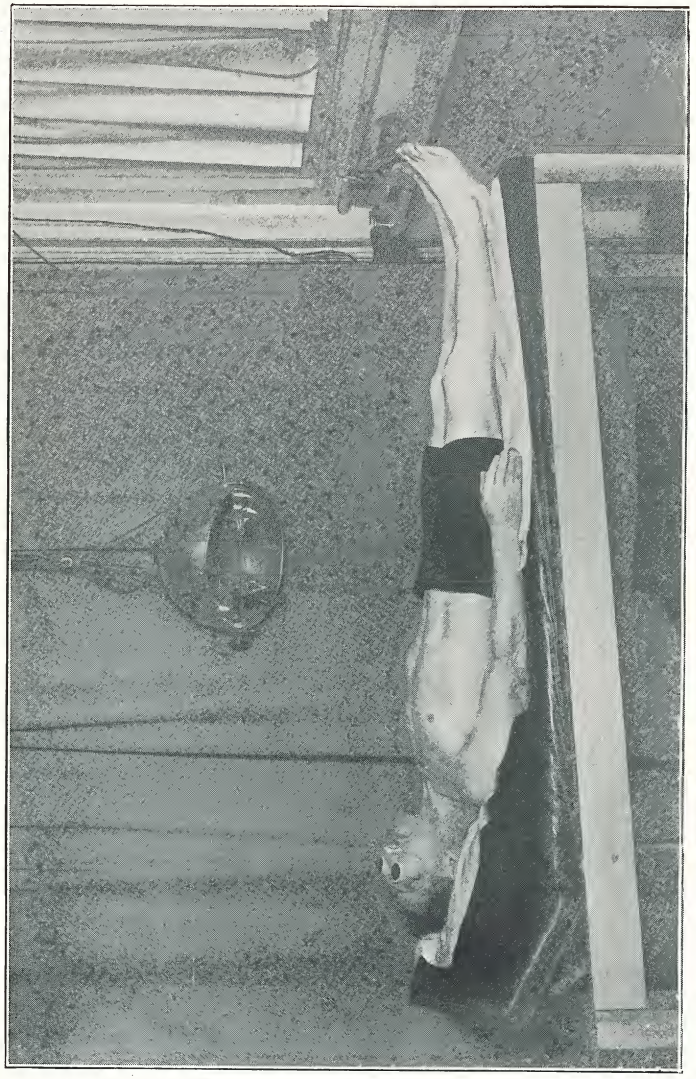


FIG. 36.—General Irradiation with Mercury Vapour Lamp. [*To face p.* 104.